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Insights on the global micro-CHP market

ARPA-E GENSETS Annual Review

14-15th December 2016

Renaissance Denver Downtown Hotel, Denver, CO.

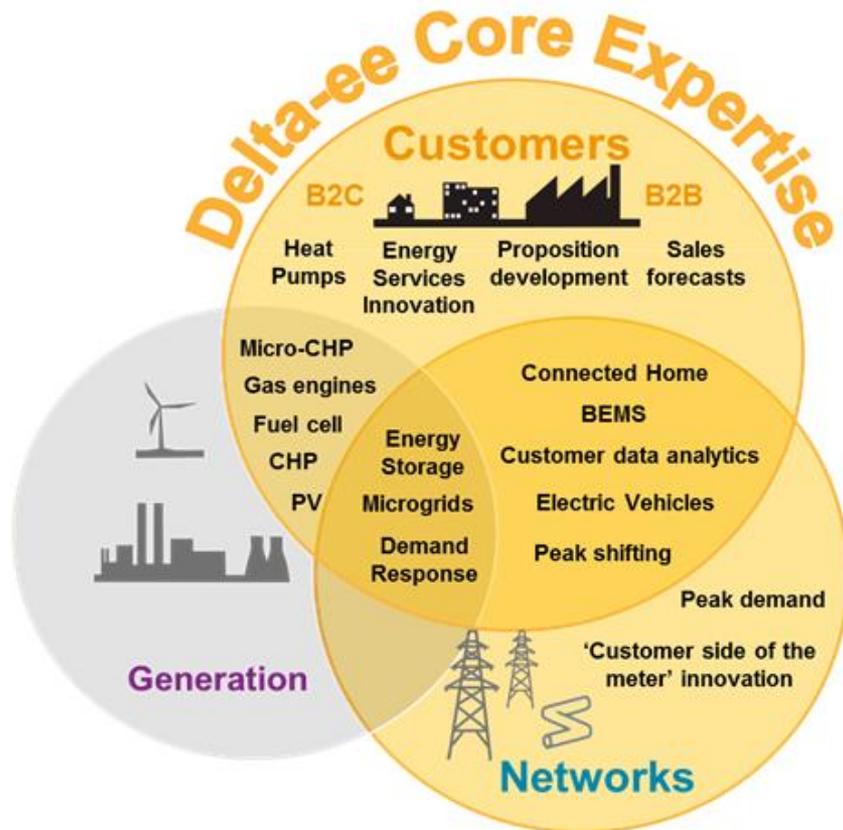
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Delta-ee helps companies navigate the transformation to a more distributed, customer centric, service-orientated energy future.



Delta-ee brings:

- ▶ Customer insight
- ▶ Technology expertise on the customer side of the meter
- ▶ Policy & regulation
- ▶ Detailed market insight
- ▶ Business model innovation

Delivering:

- ▶ Market analysis & scenarios
- ▶ Demand forecasts & profiles
- ▶ Technology assessment
- ▶ Strategy development & business model analysis
- ▶ Customer propositions

Selected clients:

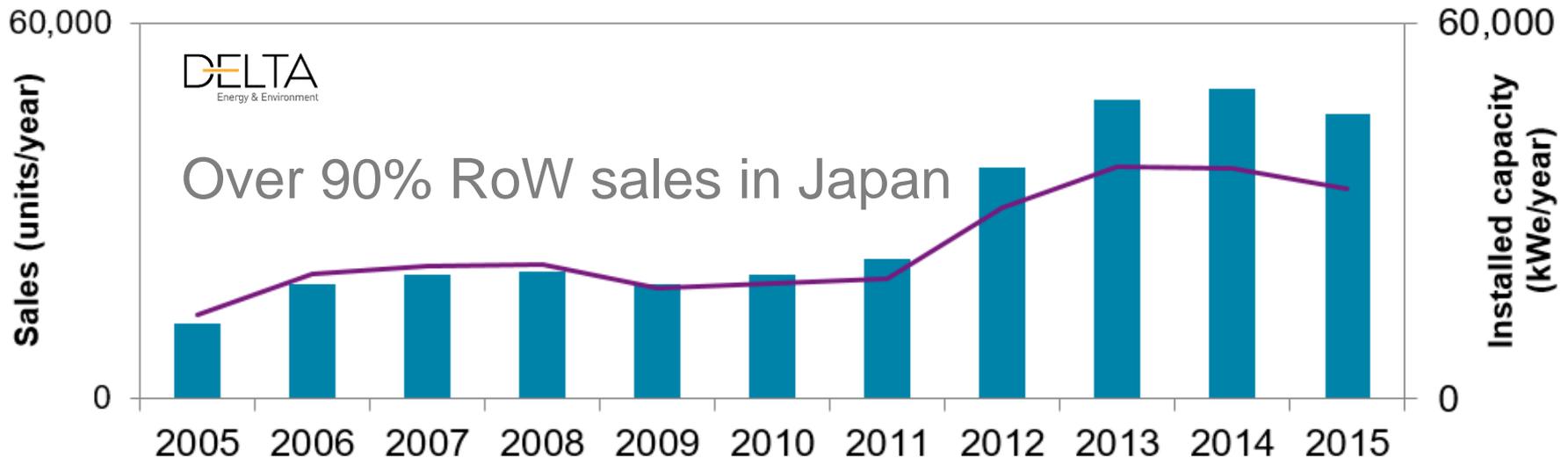
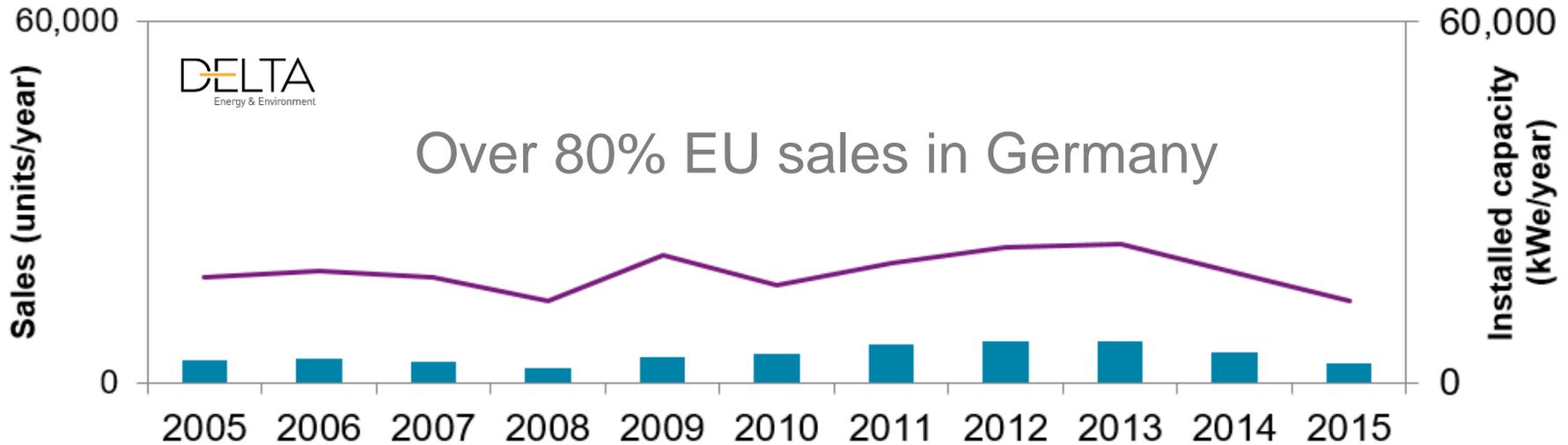


- ▶ Global micro-CHP market overview
- ▶ Hotspots of activity
- ▶ Technology deployment trends
- ▶ US market status
- ▶ Key market drivers / successes
- ▶ Technology analysis
- ▶ Delta-ee global $\leq 5.5\text{kWe}$ market forecast
- ▶ Recommendations for ARPA-E developers
- ▶ Questions

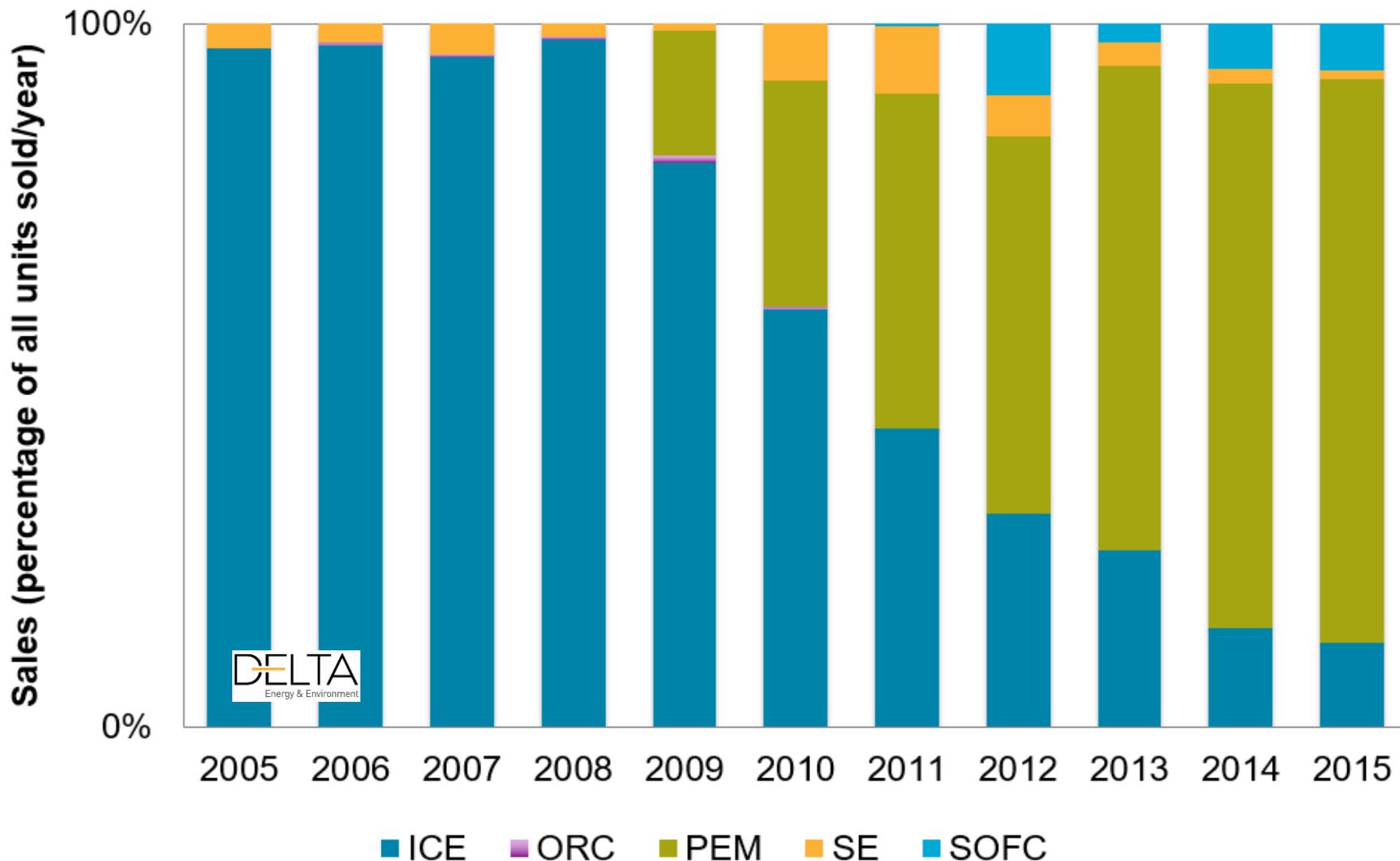


Image: Samad Power

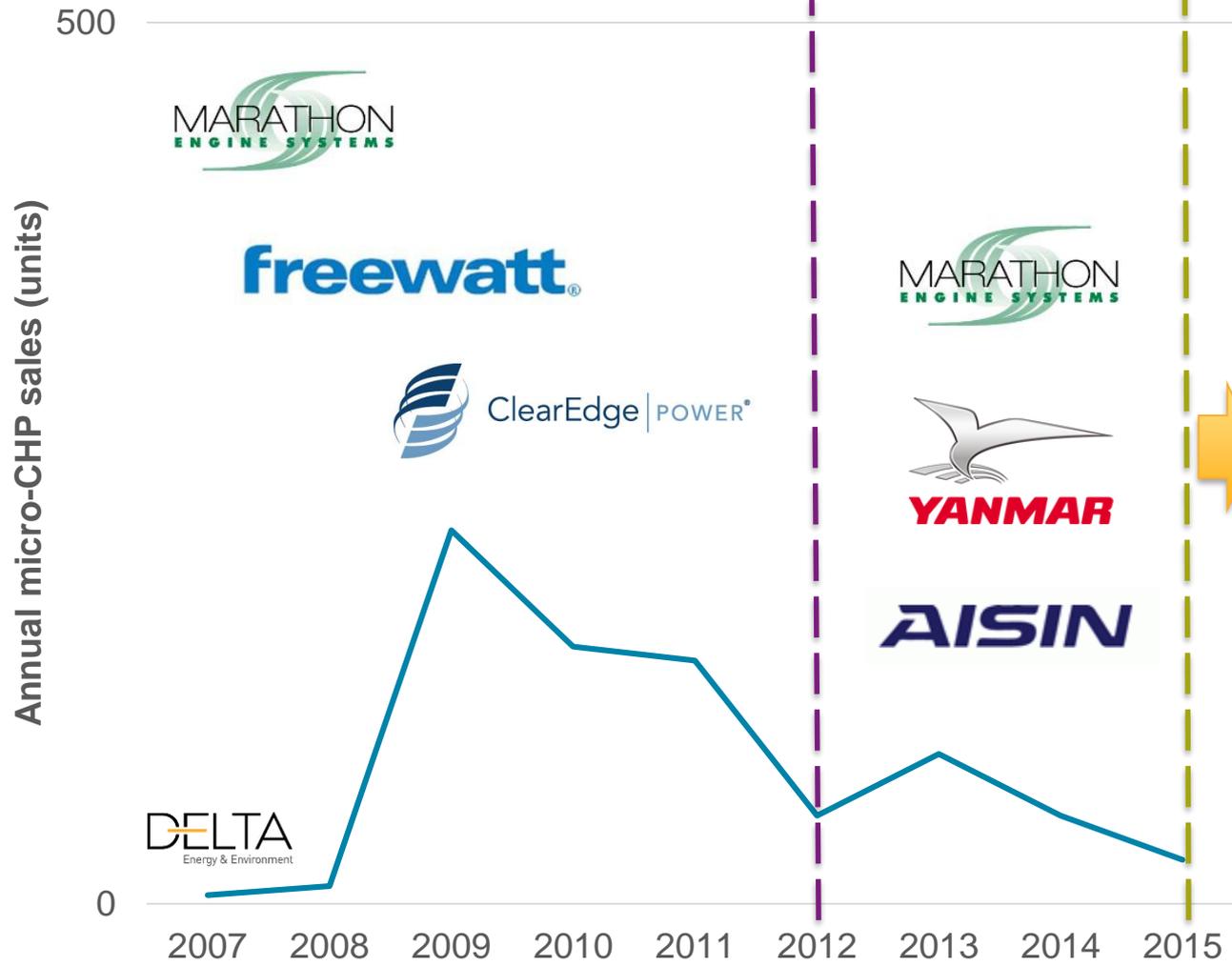
EU vs RoW sales is tale of two key Markets: Germany and Japan



Post 2010 there has been a shift in technology focus from engine-based products, to fuel cell micro-CHP



US market activity has stuttered along, with some early key players exiting the market as others bide their time



- MARATHON ENGINE SYSTEMS
- YANMAR
- AISIN
- Qnergy
- m-trigen
Power Generation Systems Solutions
- SOLID POWER
- CeresPower
- NAVIEN
- ???

Key supporting policies for micro-CHP (globally): Vary significantly from market to market, but are key to early uptake

United Kingdom 

Generation tariff (13.45p/kWh).
Export tariff (4.85p/kWh).
Reduced VAT: 5%.
Enhanced Capital Allowances: Variable

Germany 

Up-front grant: 40%-45% total cost (*FC only*).
Up-front grant: from €1,900 (all techs).
Generation tariff: €0.04/kWh.
Export tariff: €0.08/kWh.
Ecotax exemption: €0.0055/kWh
Avoided network use tariff: €0.01/kWh

South Korea 

Up-front grant: up to 50% costs (*Stirling engine only, Seoul only*).
Up-front grant: up to 90% costs (*FC only*).
Reduced gas price: 40% cheaper (*FC only*).
Export tariff: (~0.03/kWh) (*FC only*).

Canada 

Key state is Ontario:
Net metering (<500MW; \$c10-20/kWh)
MicroFIT (<10kWe; \$c12-30)

USA 

Support varies by state; mostly aimed at large-scale CHP.
New York: **upfront grant** of ~\$1,000 per 1kWe.

Netherlands 

Net metering of electricity (€0.17/kWh).

Japan 

'ENE.FARM' up-front grant: ¥190,000 (€1,500) for SOFC (*FC only*).
Regional up-front grants (some regions): up to ¥200,000 (€1,500) for SOFC (*FC only*).
Export tariff (some gas suppliers): ~¥13/kWh (€ 0.11/kWh).

France 

Export tariff: €0.04 - €0.14/kWh).
Tax break: 25% cost rebate – up to 30% from start April 2017.
Up-front grant: €1,350.
Reduced VAT: 5.5%.
White Certificates.

Belgium 

Up-front grant: 20% of the invoice amount with a max. limit of €15,000 (*Wallonia-only*)
Net metering of electricity (~€0.23/kWh).
Green Certificates: €20 – 90/MWh.
CHP Certificates: €30 – 40/MWh.

Italy 

Net metering of electricity (€0.24/kWh).
Tax break: 50% to 65% cost rebate.
Reduced VAT: 10%.
White Certificates: € variable.

Other key drivers behind success in micro-CHP sales to date:
The 4 'D's'

▶ **Direct**



▶ **Dedicated**



▶ **Discount**



▶ **Disruptive**



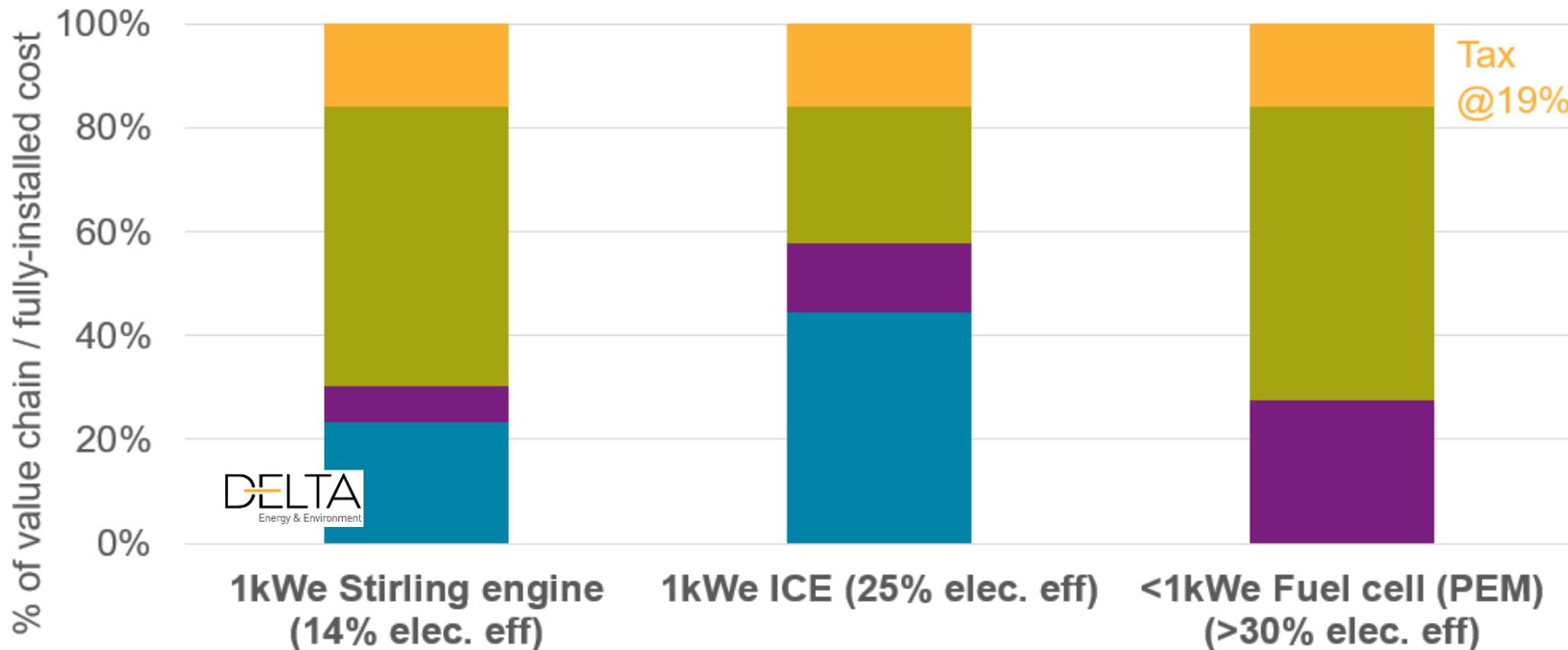
Technology analysis: RoW progress against US product spec. targets highlights the scale of the challenge

Typical sales (units / year):

Low 1,000s

Low 100s

Low 100s



■ System cost ■ System cost with MSP margin ■ Fully-installed cost (no Tax) ■ Fully-installed cost (+ Tax)

Summary: Delta-ee's key points to consider for ARPA-E participants looking to approach the market (learning from EU and Asia)

- ▶ **HVAC manufacturers:** Potentially strong partners but also slow to deploy. Micro-CHP may be only 1 product in a wide portfolio.
- ▶ **Utility partners:** Similar – unless you can give added value e.g. customer retention.
- ▶ **Trial, trial, trial:** Several heating seasons worth of data and design tweaks.
- ▶ **Targeted routes to market:** Are what have worked so far e.g. new build in Japan, SenerTec's own sales force. Can't just 'dump' m-CHP into the HVAC market.
- ▶ **Know your customer & your market:** Acceptable RORs, product configurations (wall hung or floor standing), regulatory constraints e.g. NOx limits, all vary widely.
- ▶ **Don't rush to market, and have a clear strategy:** Those who try to adjust / change their USP have struggled so far.
- ▶ **Incentives:** Not a solution for a sustainable long-term offering, but helpful initially.
- ▶ **Disruption is possible:** And is key to bypassing some of the margin added by the conventional heating supply chain.

“Unrivalled insight into the global micro-CHP industry. With more than 10 years of market-leading analysis, our research arms you with the information you need to guide your micro-CHP strategy”.

Service Member deliverables include:

- ▶ **Four research reports per year (+ webinar/podcast on each report)**

This includes the ‘Micro-CHP Annual Roundup’ and the ‘Market Statistics and European 2020 Forecasts’

- ▶ **Online library of micro-CHP policies and incentives**

Including the Delta-ee view on the effectiveness of these support mechanisms.

- ▶ **E-mail updates containing industry latest news and analysis**

- ▶ **Online library of micro-CHP developers and manufacturers**

Company and product profiles of over 50 micro-CHP product developers and manufacturers.

- ▶ **Enquiry service**

Gives Service Members direct access to our micro-CHP experts, who will serve as a research extension of your business.

- ▶ **Complimentary place at the Annual ‘Micro-CHP in Europe’ Summit & exclusive Roundtable Event.**

- ▶ **Once a year tailored onsite presentation (optional)**



Developers and Manufacturers



11th Annual Micro-CHP in Europe Summit
8-9 June 2016, Radisson Blu, La Maison des Brasseurs, Brussels

Available by annual subscription.



Thanks for listening!

Questions?

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